

REMARKS

Claims 1-22 and 24-36 remain pending in the present application. Claim 3 has been amended to correct an antecedent basis issue identified by the Applicant. Basis for the amendments can be found throughout the specification, claims and drawings as originally filed.

REJECTION UNDER 35 U.S.C. § 103

Claims 1, 4, 6-12, 17, 35, and 36 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Heyring (6,270,098) in view of Heyring (6,761,371). Claim 18 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Heyring ('371) as applied to claims 6 and 17, and further in view of Kobayashi (7,210,688). Applicant respectfully traverses these rejections. Claims 1, 6 and 7 define that the vehicle is primarily supported by the resilient support means which is functionally separate from the damping and stiffness system.

The Examiner states that Heyring '098 does not disclose a front and rear resilient support means and the Examiner looks to Heyring '371 to teach the support means (17). Applicant respectfully disagrees with the Examiner. In Heyring '098 the load distribution system itself (damping and stiffness system) includes the resilient support means which is the primary support for the vehicle. Thus, there is no incentive to combine the separate resilient support means from Heyring '371 because Heyring '098 already includes the resilient support means.

As stated in Heyring '098 in column 1, line 16-34, the invention in Heyring '098 is an improved construction of the load distribution unit developed by Applicant which is

described in PCT/AU95/00096. US 6,010,139 (of record) is the U.S. filing for PCT/AU95/00096 and in column 1, lines 23-28, US 6,010,139 defines that the suspension system supports the vehicle body and comprises ram means between each wheel and the vehicle body. Thus, the load distribution unit in US '139 provides the primary support for the vehicle body and thus, the load distribution unit in US '098 also provides the primary support for the vehicle body and there is no incentive to add the separate resilient means from Heyring '371.

The present specification supports this position of the Applicants. On page 1, lines 5-21 of the published PCT application, the specification discusses the 6,010,139 patent and the 6,270,098 patent, both of which are assigned to Kinetic, Limited, the assignee of the present invention. These prior art documents are incorporated by reference into this present application. The specification states "This system supports the weight of the vehicle, so as the loads on the vehicle change, the volume of fluid in each of the six volumes in the system must be adjusted." Thus, a person skilled in the art would know that the rams of the '098 reference support the vehicle weight and there would be no incentive to combine Heyring '371 with Heyring '098.

The present invention utilizes separate support means which provide the primary support for the vehicle. This feature is detailed in the PCT/AU2003/001637 Publication (the basis for this US application) on page 8, line 22 to page 9, line 29 and page 14, line 23 to page 15, line 7. Here, it states that the primary advantage is that the hydraulic system does not support significant weight of the vehicle which means that each hydraulic fluid volume does not need to be individually controlled to a high-pressure which is a major cost saving over the prior art. This also allows the hydraulic system to

be engineered for a lower pressure which also significantly reduces cost and size of components.

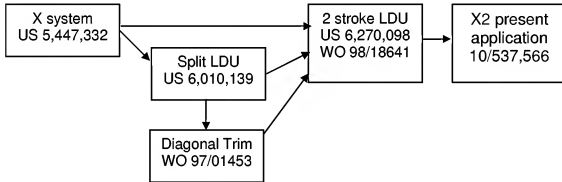
This provides substantial cost, weight and performance benefits arising from the present invention. In particular:

- The hydraulic system is not required to carry a substantial portion of the load of the vehicle body which means that the pressures in each hydraulic volume are no longer required to support the vehicle.
- Thus, the hydraulic pressures in the system volumes: can be maintained at a lower pressure.
- Lower pressure differential across cylinder rod seals giving reduced friction – which is critical to ride comfort.
- Reduced rod diameters reduces rod weight and increases effective piston area in rebound which reduces rebound damping pressures and allows for further reductions in cylinder pressure rating, cost and weight.
- The system can be rated to lower operating and peak pressures.
- Pressures can be equal so there is a minimal pressure differential across some or all piston seals in the cylinders and load distribution unit.
- Minimal leakage across pistons because of lower overall operating pressures.
- Reduced friction from piston seals because of lower overall operating pressures.
- Total system cost and weight is dramatically reduced because of lighter and lower cost components: a control system capable of load leveling

where all load is carried by the hydraulic system can form a major portion of the cost of the entire suspension system – this is not required in the present system.

- Pressure rating of other components, especially cylinders, can be significantly reduced giving a corresponding reduction in both cost and weight of the system.

The invention of the present application evolved through the technology family, as follows:



As illustrated in the drawings of the '098 reference, the piston rods of the rams are represented as being significantly larger in comparison to the pressure tube than the piston rods on the rams illustrated in the drawings of the present invention. The reasons for this is that the piston rods of the '098 application support the weight of the vehicle body as discussed above.

Hydraulic System Supporting Vehicle Body vs. Not Supporting

The drawings show thick rods and this is supported by corresponding disclosure through the use of words like "major" and "minor" chamber in the '098 2-stroke LDU

(Load Distribution Unit) description and claims (versus the terms compression and rebound chambers in the present “X2” application). These differences in terminology used between the prior art and the present invention support what is disclosed in the drawings (or vice versa) – the rods in the prior art ‘098 document are large to support the vehicle body and the rebound piston areas are small.

From lines 5-13 on page 6 of the PCT family member (published as WO 98/18641) of cited US ‘098 2-stroke LDU document, the use of the LDU with diagonally cross-connected pairs of rams or single-acting rams is disclosed. Figure 1 again shows the thicker rods to allow the hydraulic system to support the weight of the vehicle.

Importantly, Kinetic’s related “diagonal trim” PCT/AU96/00397 application (published as WO 97/01453 shown above) is also referenced (in fact incorporated therein by reference) on page 6 lines 17-19 of the PCT version of the ‘098 citation (and consequently in the ‘098 citation itself) as a control method to control the suspension system disclosed in ‘098. This “diagonal trim” PCT/AU96/00397 document (and the X-system and Spit-LDU prior art discussed in the background section) clearly states (including in the abstract of “diagonal trim” PCT/AU96/00397) that the wheel rams 1-4 **support the vehicle body.**

NONE of these documents suggest using separate support means. They ALWAYS implicitly or explicitly describe the hydraulic system supporting the vehicle body.

System Control

The 4 hydraulic system volumes in these prior art documents can all be controlled by measuring displacement of the wheels and the LDU, since the hydraulic system **supports the vehicle** and the pressures in the system volumes are determined solely by the load on the vehicle, they CANNOT be controlled to any preset pressure.

Conversely in the present invention (X2) the SEPARATE SUPPORT defines the position of each wheel ram and as the rams provide little or negligible push-out force (as the hydraulic system is not the primary support means) so the pressure in each system volume is independent of vehicle mass and load and needs to be controlled. Indeed as noted on page 9 of the PCT publication, in lines 12-26 the pressures at which the volumes are regulated can be varied to adjust roll and pitch stiffness. As the X2 system provides negligible heave stiffness or push-out force (else the support means would not be the primary means of support), this adjustment of pressure (and roll and pitch stiffness) has a negligible effect on heave stiffness or vehicle height.

Thus, the prior art system in '098 serves a different function and has a different control strategy to the present invention:

The prior art '098:

- comprises a hydraulic system which supports the vehicle body and provides all the required roll, pitch and heave stiffness and all the required damping for the suspension system.
- has the volume of fluid in each volume primarily controlled by displacement of the rams because it is a vehicle supporting system, the pressure inherently being determined by the load.

- requires large rod diameters in the wheel rams and high operating pressures to provide the push-out forces to support the vehicle.

In contrast, the present invention:

- is primarily supported by separate support springs, not the hydraulic system.
- provides a roll stiffness and pitch stiffness whilst providing zero warp stiffness and negligible heave stiffness.
- provides all the required damping for the suspension system.
- requires pressure control of the fluid volumes.
- can have operating pressures in the fluid volumes varied to adjust roll and pitch stiffness.
- uses smaller rods and much lower operating pressures as there is no static push-out force requirement (it is not supporting the vehicle body) so pressure rating, weight and cost can be significantly reduced.
- fluid volumes can be regulated to lower pressures simplifying the control system and reducing its rating, further reducing weight and cost.

Thus, Applicant believes claims 1, 6 and 7, as pending patentably distinguish over the art of record. Likewise, Claims 4, 8-12, 17 and 18 which ultimately depend from Claim 1 or Claim 6 are also believed to patentably distinguish over the art of record. Applicants believe Claims 35 and 36 were listed by mistake because these claims depend from Claim 7 which, along with Claims 35 and 36, was indicated as being allowable.

CONCLUSION

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action and the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1600.

Respectfully submitted,

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